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The Post-childbirth Employment of Canadian Mothers and the Earnings Trajectories of Their Continuously Employed Counterparts, 1983 to 2004

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Abstract

Using the 1983-to-2004 Longitudinal Worker File, this study examines the post-childbirth employment, job mobility and earnings trajectories of Canadian mothers. We found that both the long- and the short-term post-childbirth employment rates of early 2000s cohorts of Canadian mothers were higher than their mid-1980s counterparts, and, relative to childless women, Canadian mothers became less likely to quit over time.

Our data also allow us to examine the earnings impact of childbirth for a group of Canadian mothers who had strong labour market attachment. For them, earnings dropped by 40% and 30% in the year of childbirth and the year after, respectively. Under both the fixed-effects and the fixed-trend models, the earnings impact of childbirth declined over the other post-childbirth years. Results from the fixed-trend model further suggest that, from the second to the seventh post-childbirth years, the negative effects varied between 8% and 3% and became negligible thereafter.

Keywords: maternity leave, post-childbirth employment, family gap

Executive summary

Researchers and policy makers are interested in the effects of childbirth on the labour supply and the earnings of the mothers, and extensive studies have been conducted in these areas. More recently, two strands of literature on childbirth and the labour market outcomes of women have drawn particular interests: one focuses on the effect of maternity-leave policies on the post-childbirth employment of the mothers; and the other concerns the 'family gap,' the pay or earnings difference between women who have children and childless women.

The two strands of literature are closely related. The birth of a child has an immediate negative effect on the employment of the mother because the benefits of staying at home and the costs of working rise for the new mother, and if she decides to stay at home and she stays for too long, her human capital may depreciate, or a productive job-worker match may disappear. As a result, her pay rate and earnings would be negatively affected, not only during the years immediately after the birth, but also over a number of post-childbirth years.

Available studies tend to focus on the immediate or the short-term effect of childbirth, paying little attention to the long-term employment and earnings impacts of childbirth, often because of data limitations. On the other hand, studies on the family gap typically estimate a single 'motherhood effect' on the wage or earnings of the mother, and they rarely examine how the effect evolves along the post-childbirth years.

In contrast to previous work, we investigate the employment and job mobility patterns of Canadian mothers in both the short and the long run. We pay particular attention to the evolution of the short- and long-run post-childbirth employment over the past 20 years in Canada. The underlying population of interest consists of women who had held a paid job for a certain time period before giving birth. Based on this population, we first establish a 'broad' sample of Canadian mothers who satisfied certain employment conditions that enabled them to enjoy the job-protected maternity leaves and maternity/parental benefits.

Based on this broad sample, we found that (a) the short-term post-childbirth employment rates of Canadian mothers rose from the early 1980s to the year 2000, and declined since then; (b) the long-term post-childbirth employment rates of Canadian women who had given birth in the early 2000s were much higher than their counterparts who had given birth in the mid-1980s; (c) and, Canadian mothers have become less likely to quit over time, when compared with their 'non-mother' counterparts.

In the context of the family-gap literature, this study also examines the earnings trajectories of Canadian mothers. But, due to a number of data limitations, we focus on a 'narrow' sample of Canadian mothers—those who had strong labour market attachment—in this part of the study. Nevertheless, we are able to make two contributions to the literature. On the one hand, several studies indicate that interruptions to one's career as a paid employee lead to earnings losses that can never be fully regained. Our result indicates that the motherhood earnings penalties declined over the post-childbirth years and may disappear eventually. On the other hand, it can be argued that the motherhood earnings penalty is weak for mothers who have strong labour force attachment. If this is the case, our results should help to gauge the lower limit of the motherhood earnings penalty.

Based on the narrow sample of Canadian mothers, we first found that the earnings of mothers did not decline in the pre-childbirth years: a result that casts some doubts on the endogenous motherhood hypothesis; second, we found that the motherhood earnings penalties were sizeable: in the year of childbirth and the year after, mothers from our sample experienced about 40% and 30% earnings drops, and they continued to incur earnings losses during a number of post-childbirth years; and, third, the earnings effects of childbirth were not constant; rather, they declined over the post-childbirth years, and the result from our most flexible model indicates that the motherhood earnings penalties disappeared seven years after childbirth.

Furthermore, earnings losses for mothers who returned to and worked for their pre-childbirth employers were negligible beyond the second year of childbirth when the individual earnings growth trend is taken into consideration. This result suggests that firm-specific human capital is likely an important factor in the earnings recovery process for Canadian mothers.

1 Introduction

As a key family event, the birth of a child has important implications for the wellbeing of the mother, the child and the family. Economists are primarily interested in the effects of childbirth on the labour supply and the earnings of the mothers, and extensive studies have been conducted in these areas.[1] More recently, two strands of literature on childbirth and the labour-market outcomes of women draw particular interests: one focuses on the effect of maternity/parental-leave policies on the post-childbirth employment of the mothers; and the other concerns the 'family gap,' the pay or earnings difference between women who have children and childless women.

The two strands of literature are closely related. The birth of a child has an immediate negative effect on the employment of the mother because upon the birth of a child, the benefits of staying at home and the costs of working rise for the mother. Also, if she stays out of the labour market long enough, on account of, for example, extensive maternity/parental leaves, her human capital may depreciate or a productive job-worker match may disappear. As a result, her pay rate and earnings would be negatively affected, not only during the years immediately after the birth but also over a number of post-childbirth years.[2]

Available studies, however, tend to focus on the immediate or the short-term effects of childbirth, paying little attention to the long-term employment and earnings impacts of childbirth, often because of data limitations. For example, Baker and Milligan (2005) examine the post-childbirth employment effect of job-protected maternity/parental leave legislations in Canada up to four months using data from Statistics Canada's Labour Force Survey, while Marshall (1999) and Hanratty and Trzcinski (2005) examine the employment of mothers up to two years after childbirth. One recent study that pays attention to the long-term employment effect of childbirth in Canada is Skuterud (2008); but he focuses on married mothers who experienced one childbirth only. On the other hand, studies on the family gap typically estimate a single 'motherhood effect' on the wage or earnings of the mother and they rarely examine how the effect evolves along the post-childbirth years.

In contrast to previous work, we investigate the employment and job mobility patterns of Canadian mothers in both the short and the long run. We pay particular attention to the evolution of the short- and long-run post-childbirth employment over the past 20 years in Canada, during which the maternity related benefits and job protection legislations changed dramatically. Since these policy and legislations applied to employed women only, the underlying population of interest consists of women who had held a paid job for a certain time period before giving birth. Based on this population, we first establish a 'broad' sample of Canadian mothers who satisfied certain employment conditions that enabled them to enjoy the job-protected maternity/parental leaves and benefits.

Based on this broad sample, we found that (a) the short-term post-childbirth employment rates of Canadian mothers rose from the early 1980s to the year 2000, and have declined since then; (b) the long-term post-childbirth employment rates of Canadian women who had given birth in the early

1. Reviews of the early literature can be found in Killingsworth and Heckman (1986), Nakamura and Nakamura (1992) or Browning (1992).

2. Browning (1992), for example, concludes that children aged up to 10 years old could be as costly as infants in terms of time demand to their parents.

2000s were much higher than that of their counterparts who had given birth in the mid-1980s; and, (c) Canadian mothers became less likely to quit or to change employer over time, when compared with their 'non-mother' counterparts.[3]

In the context of the family-gap literature, this study also examines the earnings trajectories of Canadian mothers. But, due to a number of data limitations, we focus on a 'narrow' sample of Canadian mothers—those who had a strong labour market attachment. Nevertheless, we are still able to make two contributions to the literature. On the one hand, several studies indicate that interruptions to one's career as a paid employee lead to earnings losses that can never be fully regained.[4] Our result suggests that, at least with a group, and perhaps an increasingly important group, of mothers who have strong labour market attachment, the earnings losses associated with childbirth—a typical career interruption for women—decline over the post-childbirth years, and results from our most flexible model suggest that the impact disappears after seven years. On the other hand, it can be argued that the motherhood-earnings penalty is weak for mothers who have strong labour-force attachment.[5] If this is the case, our result should help to gauge the lower limit of the motherhood-earnings penalty.

One feature of this study is that we borrow techniques from the program evaluation literature by establishing a comparison (or control) group of women for different cohorts of mothers (the treated group). This allows us to obtain the difference-in-differences estimates for the parameters of interest based on the counterfactual earnings for mothers—the earnings they would have received had they not have become mothers. With our data, we are able to estimate both the fixed-effects model—where individual specific intercept is allowed—and the fixed-trend model—where individual specific-earnings growth path is also allowed.

For the narrow sample of Canadian mothers, our results indicate that (a) the earnings drop for the mothers during the year of childbirth varied around 40%, and the maternity/parental leave benefits compensated for about half of this drop; (b) the negative effects of childbirth on the earnings of the mothers declined over the post-childbirth years and the result from the most flexible model (fixed trend) suggests that the effect disappeared after seven years; and (c) the result from the fixed-trend model also implies that the negative effects of childbirth for mothers who returned to their pre-childbirth employers were negligible beyond the second post-childbirth year.

The remainder of this paper is organized along the following lines. In Section 2, we discuss the dataset and establish the broad and narrow samples of mothers and their non-mother counterparts. In Section 3, we examine the post-childbirth employment of Canadian mothers, based on the broad sample. Section 4 introduces our main empirical framework, while Section 5 presents the estimates of the motherhood earnings penalty for the continuously employed mothers. In Section 6, we discuss the robustness of the results. A summary and the conclusions are contained in Section 7.

---

3. The 'non-mother' women (the comparison or control group) were those who did not give birth during a specified period. They might have given birth before being observed or they may have given birth subsequently.

4. These include the work by Corcoran (1979), Jacobsen and Levin (1995), Mincer and Ofek (1982) and Stratton (1995). See also Phipps, Buirton and Lethbridge (2001).

5. For example, those with strong labour force attachment are often those who have strong human capital endorsement and tend to return to the labour market sooner rather than later after childbirth. As a result, they would experience less human capital losses associated with childbirth. See Shapiro and Mott (1994).

2 Data

2.1 Longitudinal Worker File

The dataset used in this study is the Longitudinal Worker File (LWF). This is a 10% random sample of all Canadian workers, constructed by integrating data from four sources: the Record of Employment (ROE) files of Human Resources and Social Development Canada; the T1 and the T4 files of Canada Customs and Revenue Agency; and the Longitudinal Employment Analysis Program of Statistics Canada's Business and Labour Market Analysis Division.

The ROE indicates the reason for a job interruption; among those reasons is maternity leave. Maternity leave is protected by the employment standards legislations in all Canadian jurisdictions. It is designed to give mothers the possibility to temporarily withdraw from the labour force because of pregnancy and to allow them some time to recuperate after childbirth. We identify the motherhood status of an employed woman through her maternity leave.

An immediate question is how well the above birth concept captures the actual birth. To address this, we use data from Statistics Canada's Survey of Labour and Income Dynamics, from 1993 to 2004, to calculate the number of births given by employed women who were 18- to 49-year-olds. These are contained in Column 2 of Appendix Table A.1. These can be compared with Column 1, the estimated number of mothers from the LWF for the same period using the maternity-leave based concept of childbirth. Notice that Column 1 contains the estimated number of women who took maternity leaves (and hence the number of women who gave birth), while Column 2 represents the estimated number of children born from employed women; therefore, it is natural there are some variations between Columns 1 and 2 because of sampling errors, as well as non-sampling errors such as multiple births. Nevertheless, the two columns are fairly close to each other, and thus, we are reasonably confident that our maternity-leave based concept of childbirth captures the actual births very well.

The LWF offers two main advantages over other data sources. On the one hand, the large sample size allows us to establish a group of women—the control group in the language of program evaluation—who did not give birth during a certain period of time. This control group of women helps us to estimate the counterfactual earnings profile of the mothers. On the other hand, since the data span more than 20 years, they allow us to study how the effects of motherhood on employment and earnings have changed over time.

The LWF also provides more reliable and accurate information than other data sources. For instance, since employers must register with Canada Customs and Revenue Agency and issue each employee a T4 slip that summarizes earnings received during a year, the earnings data should be free from recall errors of individual workers. In terms of information on job separation, the *Employment Insurance Act* requires an employer to issue a ROE when an earnings interruption occurs to an employee who works on an insurable job, and a penalty or prosecution under the *Employment Insurance Act* for non-compliance may apply to employers who fail to issue a ROE and employers who enter a false or misleading reason for a job separation. In addition, the LWF contains employer identifiers. This allows us to distinguish mothers who returned to the same employers from those who did not return to their previous employers after having taken maternity leave.

Like other administrative datasets, the LWF contains little information on workers' individual and family characteristics such as education, work experience, union status, occupation, family income, marital status and so on.[6] But the fact that the LWF tracks a nationally representative sample of workers over a very long period of time makes it a unique dataset to examine both the long- and the short-term employment and earnings effects of motherhood.

2.2 Samples of mothers and non-mothers

The lack of certain variables in the data forces us to work with a rather restrictive sample of mothers in order to estimate the motherhood-earnings penalties. To examine the effect of the sampling restrictions, we start with a fairly broad sample of mothers. They consist of those who satisfied the following three conditions: (1) they were aged from 20 to 39 in the year they gave birth (year *t*); (2) in year *t*, they were employed before taking maternity leave and experienced no other job separation (other than that due to maternity leave); and, (3) in year *t*-1, they had worked and had experienced no childbirth. The comparison group of women satisfied all of the above conditions, except that they did not give birth in year *t*.

We impose the first restriction to avoid potential problems associated with teenage mothers, who may have different earnings profiles than other women on account of, for example, missing/delayed education and thus had lowered/delayed human capital investment. The second and the third restrictions enable us to focus on women who had held a paid job for a period of time before giving birth such that they were qualified for the maternity benefits and were covered by mandatory job protection. These restrictions allow us to construct 19 cohorts of mothers (from the 1984, the 1985, up to the 2003 cohort). They represent about 86% of all employed women who became mothers in the 1984-to-2003 period.

For women in the comparison group, we also assign each of them to a cohort of non-mothers. For example, the 1984 cohort of non-mothers includes women who were aged from 20 to 39 in 1984 (year *t*), who were employed in both 1983 (year *t*-1) and 1984, and who did not experience any job separation in these two years. We use the broad sample primarily to produce some time series measures of post-childbirth employment, job mobility and earnings for Canadian mothers and the corresponding measures for the comparison groups. Table 1 provides some simple statistics on three representative cohorts (1984, 1994 and 1999). Additional characteristics for these mothers and other women are contained in Appendix Table A.3.

6. The Survey of Labour and Income Dynamics contains this information, but the six-year panels are not long enough to allow us to examine the earnings changes several years prior to and several years after childbirth.

Table 1
The two samples of mothers and other women, mean age and number of observations

	Mean age	Number of observations
Sample 1		
1984 cohort		
Mothers	28.0	11,440
Other women	28.7	199,359
1994 cohort		
Mothers	29.7	13,149
Other women	30.1	214,952
1999 cohort		
Mothers	30.2	12,099
Other women	29.9	236,104
Sample 2		
1991 to 1996 cohorts: 1 or 2 births	28.6	7,086
1991 to 1996 cohorts: 1 birth	29.4	3,714
Other women	31.6	20,992

Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

Our second (narrow) sample of mothers consists of those who had one or two childbirths in the following five-year periods: 1991 to 1995, 1992 to 1996, 1993 to 1997, 1994 to 1998, 1995 to 1999 and 1996 to 2000.[7] They must not have given birth to a child in years other than the specified period. For example, the 1991 cohort of mothers consists of those who had only one birth in 1991 and those who had one birth in 1991 and another in the following four-year period (1992 to 1995). A mother from this cohort must not have given birth to a child beyond the 1991-to-1995 period. That is, they experienced no childbirth from 1983 to 1990 and from 1996 to 2004.

We further restrict the above cohorts of mothers to have been born between 1954 and 1968, so that it was possible for them to give birth in the first year that they were observed (1983), and their earnings were unlikely to have been affected by retirement considerations during the last year of observation (2004). We also restrict them to have been in the labour market, have had positive earnings in each year, and had not experienced any permanent layoff from 1983 to 2004.[8]

We could have included more cohorts of mothers in our sample, but we have chosen to focus only on the 1991-to-1995, 1992-to-1997 up to the 1996-to-2000 cohorts. While this reduces our sample of mothers, it enables us to estimate the effect of childbirth on the earnings of mothers for up to nine post-childbirth years under our empirical framework. The choice also allows us to examine the effect of childbirth on the pre-childbirth earnings for up to three years. On the other hand, if we were to have included those who had given birth earlier—for example, those who gave birth between 1988 and 1992—we would only have been able to assess the post-childbirth earnings losses for up to five years. Also, if we were to have included a later cohort—for example, those who

7. The number of women who gave birth three or more times in a five-year period was very small. We exclude them in order to facilitate the analysis.

8. 'Permanent layoff' is defined as a layoff in which the worker did not return to the previous employer in the year of layoff and the year thereafter.

gave birth between 1997 and 2001—we would only have been able to assess pre-childbirth earnings for up to two years.

A potential problem associated with the birth-year restriction on the mothers is that some of the mothers would be relatively 'old' when they were first observed (in 1983)—for example, those who were born in 1954 would have been 29 years old when they were first observed. Some of these older women might have already given birth one or more times before they were observed. So our captured births could be of the second or the third births by a woman, and their earnings could have been affected by those possible, yet unobserved, births. But if we were to select only those who were unlikely to have given birth before they were first observed, say those who were 15- to 19-year olds in the first year of observation, we would have obtained a small and non-representative sample of Canadian mothers. They would become non-representative once the other restriction— they must have been in the labour market in all observable years—is imposed, because those who had started working at ages 15 to 19 and continued in the labour market every year for the subsequent 20 years were likely to be low-educated workers. Hence, we have chosen to include women as old as 29 when they were first observed in our sample. We will check how this may affect the robustness of our results later.

There are several reasons why we require the sampled women to be in the labour market every year. The main reason is that by imposing such a restriction, we can overcome some disadvantages of the data. It is well known that in any earnings study, education and work experience are key explanatory variables. Yet we do not have any information on these variables in LWF. If we require the sampled women to be in the labour market each year, then their age can be used as a proxy for work experience. As well, if a woman worked continuously, her level of schooling would largely remain constant, and the effect of education on earnings can be taken account of with a fixed-effects model.

Another reason is that we would like to capture all childbirths by employed women. If we allow some women to have been out of the labour market for a few years, then it is possible that they gave birth once or more during these years: with LWF, we would not be able to capture these births, and yet our estimates are likely to be affected by those births if the effect of childbirth on earnings lasts for a few years. In addition, we also want to purge the effects of permanent layoff on earnings of potential mothers. Previous research shows that a permanent layoff due to plant closure or mass layoff reduces a worker's (including mother's) annual earnings in the years before, during and after the displacement.[9] Hence, by imposing the 'no permanent layoff' restriction, we will end up with an earnings profile that is free from the effect of job displacement. Finally, by requiring mothers to be in the labour market every year, we may avoid the potential biases caused by sample attrition or missing data.

When the above restrictions are imposed, we obtain our narrow sample of mothers. The six cohorts of mothers summed to 7,086 women, who gave a total of 9,440 births in the 1991-to-1996 period; and among the 9,440 births, 3,714 were from mothers who had one birth only (see Table 1). In terms of the number of mothers captured, the 7,086 mothers represented about 13% of all employed women (at the same age) who gave birth in the 1991-to-1996 period.[10] Table 1 also shows some basic information for the corresponding comparison group (other women). They consist of women

9. The case for Canada is investigated in Morissette, Zhang and Frenette (2007).

10. See Columns 3 and 4 in Appendix Table A.1 and Appendix Table A.4.

who (1) were born in the 1954-to-1968 period, and (2) had positive earnings, did not experience any permanent layoff and did not give birth from 1983 to 2004.[11]

3 Descriptive evidence on post-childbirth employment, job mobility and earnings of Canadian mothers

3.1 Post-childbirth employment

The birth of a child increases the benefits for the mother to stay at home, and if the mother stays home for an extensive period, her propensity to work in the future will likely be reduced, since a long career interruption can hinder her competence on the job or her chance to find a new job. It is thus desirable to investigate both the short- and the long-term employment effects of childbirth.[12]

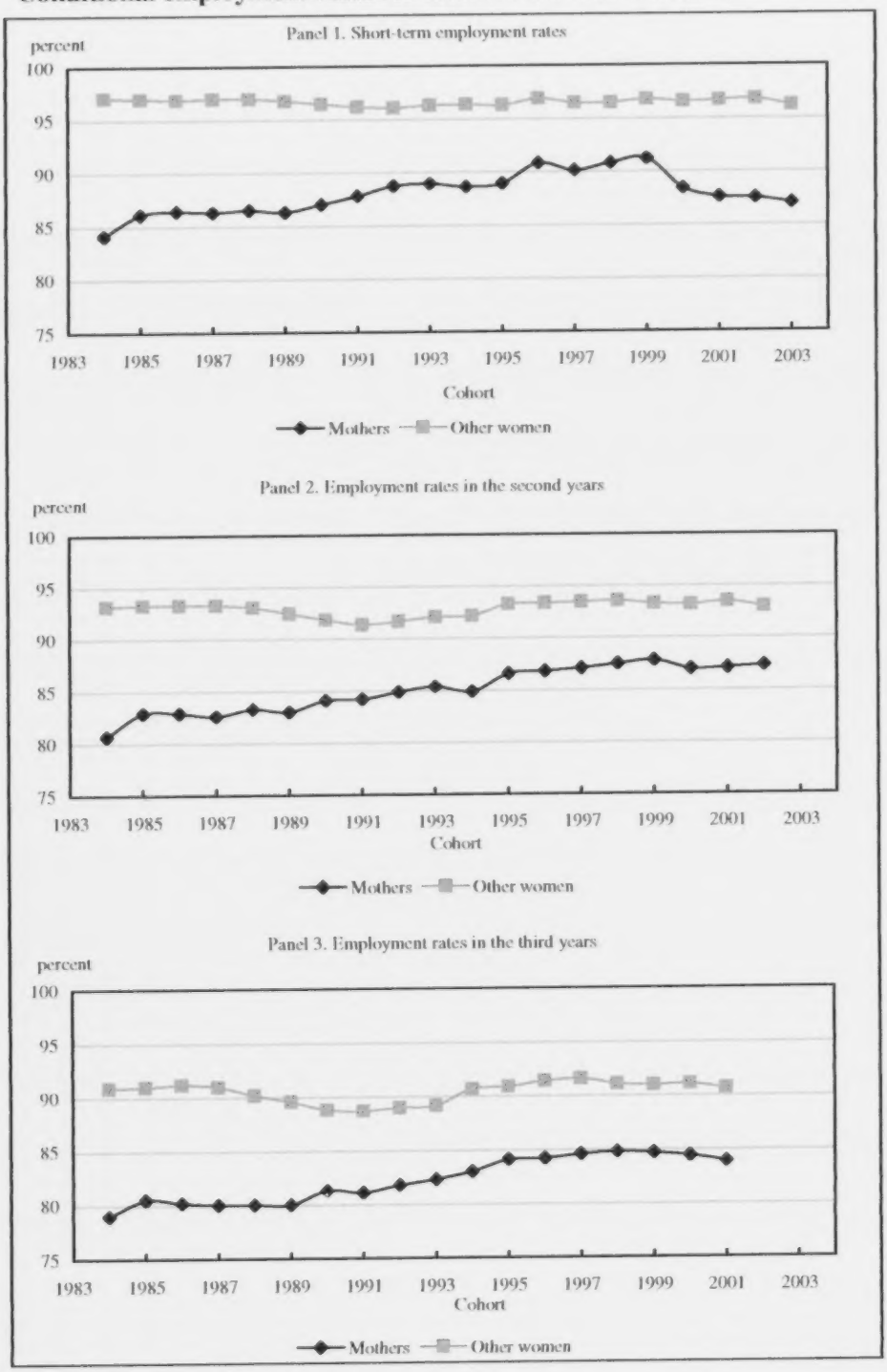
We use the percentage of mothers who return to work in the first post-childbirth year to measure the short-term employment effect of childbirth. We refer to this percentage as the short-term post-childbirth employment rate. It simply answers the following question: of all mothers who give birth in year t, how many of them are employed in year t+1? Similarly, we use the employment rates in the other post-childbirth years to measure the longer-term effects of childbirth on the employment of the mothers. Figure 1 describes the employment rates for Canadian mothers in the first, second and the third post-childbirth years. Column 1 of Table 2 and Column 1 of Appendix Table A.2 contain the employment rates for the other post-childbirth years and for those women in the comparison group.[13]

11. The age distributions of the mothers and the comparison group are slightly different in the narrow sample. We attempted to establish a different comparison group by restricting their year of birth to be in the 1957-to-1968 period, which produced similar mean and median ages to those of the treated group. With this alternative comparison group, the regression results changed little compared with those presented in the paper, where the years of birth for the control group are restricted to be the same (from 1954 to 1968) as those of the treated group.

12. A woman was defined as employed in a year if she had positive earnings from one or more paid jobs.

13. Notice that the horizontal axis of the figure represents different cohorts of mothers and non-mothers. It also measures time (year) implicitly. For example, in Panel 1, the 84% for the 1984 cohort of mothers indicates the employment rate of this cohort of mothers in 1985 (the first post-childbirth year).

Figure 1
Conditional employment rates for mothers and other women



Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

Three observations can be made from Figure 1. The first observation is that both the long- and the short-term employment rates of Canadian mothers were consistently lower than those of their non-mother counterparts. For example, the short-term employment rate of the 1984 cohort of mothers was 84%, 13 percentage points below that of their non-mother counterparts; while the employment rate of the 2001 cohort of mothers in 2004 (the third post-childbirth year) was 87%, the corresponding employment rate of their comparison group was 91%. As mentioned before, the birth of a child increases the marginal costs and reduces the marginal benefits of working, and hence it is not surprising to observe that the post-childbirth employment rates of Canadian mothers were generally lower than their non-mother counterparts.

The second observation from Figure 1 is that the short-term post-childbirth employment rates of successive cohorts of Canadian mothers increased from the mid-1980s to the end of the 1990s and then started to decline in the early 2000s. For example, for the 1984 cohort of mothers, the employment rate of mothers in the first post-childbirth year was 84%. The employment rate reached an all-time high of 91% for the 1999 cohort of mothers, and then it dropped to the 87%-to-88% level for the early 2000s cohorts of mothers.

The above observation seems to suggest a non-linear relationship between the short-term post-childbirth employment rates and the generosity of the job-protected maternity system (see the Appendix, Evolution of the job-protected maternity leave system in Canada). When the protection is short, the employment rates of the new mothers in the first post-childbirth year are low. When the protection is extended moderately, the post-childbirth employment rates increase. But when the system is substantially extended to more than a year, the short-term post-childbirth employment rates decline.[14]

The non-linear relationship can be explained as follows. When the job-protected leave was relatively short, such as 17 weeks, some mothers were simply not able to physically recover from the ordeal of childbirth, others might have had difficulty in leaving their 17-week old children to somebody else's care. These mothers might have chosen to stay at home and give up their right to return to their pre-childbirth jobs. As a result, they might have had to look for new jobs when they were ready to work. But when the job-protected maternity leave becomes moderately long, as occurred during the 1990s in Canada, the above employment barriers would disappear or at least be subdued and, consequently, the post-childbirth employment rates would increase.

But when the system was extended to more than a year, it became feasible for some mothers to take the whole first post-childbirth year off and still retain their rights for the pre-childbirth jobs. For example, in 2000, about 29% of mothers were from Quebec, Manitoba and New Brunswick. Under provincial legislations, Quebec mothers were able to retain their pre-childbirth jobs for up to 70 weeks, while mothers from Manitoba and New Brunswick were able to return to their pre-childbirth jobs after 54 weeks. Thus, Quebec mothers who gave birth in the period from the second half of August to December, and mothers from Manitoba and New Brunswick who gave birth in the second half of December 2000, were all able to take the whole of 2001 off and return to their previous jobs by January 2002. Hence, the observed decline in the short-term employment rate for the 2000 cohort of Canadian mothers was very likely the result of some of these mothers taking

14. This echoes the finding of Baker and Milligan (2005) that a moderate expansion of the job-protected maternity leave system does not, while a significant expansion of the system does, increase the time that new mothers spend at home.

more than a year off work. The same explanation applies to the declines of the short-term employment rates of the 2001-to-2003 cohorts of Canadian mothers.[15]

Table 2
Conditional employment and withdrawal rates of Canadian mothers

	Percentage of mothers working in post-childbirth years					Percentage withdrawal	
Cohort	1 year after	2 years after	3 years after	4 years after	5 years after	First 3 years	First 5 years
1984	84.1	80.7	79.0	77.6	76.5	9.7	7.1
1985	86.1	82.9	80.5	78.9	77.2	8.1	6.1
1986	86.4	82.9	80.2	78.5	77.1	8.2	6.3
1987	86.3	82.6	80.0	77.5	76.2	7.7	6.1
1988	86.5	83.3	80.0	77.8	76.8	7.7	6.4
1989	86.3	83.0	80.0	77.1	75.4	8.2	6.6
1990	87.0	84.1	81.3	78.5	77.0	7.8	6.2
1991	87.8	84.2	81.1	78.8	77.2	7.4	5.8
1992	88.7	84.9	81.8	79.2	79.4	6.9	5.0
1993	88.9	85.4	82.3	81.8	80.4	6.7	4.9
1994	88.6	84.9	83.0	81.3	80.8	7.0	5.1
1995	88.9	86.6	84.1	82.4	81.4	6.1	4.6
1996	90.8	86.8	84.2	82.9	81.7	5.6	4.2
1997	90.1	87.1	84.6	82.5	81.1	5.6	4.2
1998	90.8	87.5	84.8	82.8	81.9	5.3	4.2
1999	91.2	87.8	84.7	83.2	81.9	5.1	3.8
2000	88.4	87.0	84.4	82.6	...	5.8	...
2001	87.6	87.1	83.9	...	...	5.6	...
2002	87.5	87.3	...	...	...	...	...
2003	87.0	...	...	...	...	...	...

... not applicable
Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

The third observation from Figure 1 is that the long-term post-childbirth employment rates of Canadian mothers increased from the mid-1980s and reached an all-time high in 1999, without any diversion. But the long-term employment rates of the early 2000s cohorts of mothers declined slightly. Since the employment rates of the corresponding comparison group also declined from the early 2000s, the levelling off in the long-term employment rates of the early 2000s cohorts of mothers seemed to be non-substantial.

To verify the above, we also use the long-term withdrawal rates by Canadian mothers to provide an alternative measure for the post-childbirth employment patterns for Canadian mothers. We have calculated the labour force withdrawal rates in the first three and five post-childbirth years.[16] The results (Table 2, right panel) indicate that women who gave birth in the early 2000s were less likely to have withdrawn from the labour market during the post-childbirth years than

15. We conducted probit analyses on both the short- and long-term employment of Canadian mothers by controlling age, cohort, employer size, previous earnings and province. None of these variables can explain the employment differences between mothers and other women.

16. We define a mother as a withdrawer in a three (five) post-childbirth year window if she did not receive any earnings in three (five) consecutive post-childbirth years. We do not define the short-term (such as one-year) withdrawal rates because a mother who did not work in the first post-childbirth year might have just been taking her job-protected maternity leave and hence was not withdrawing from the labour market.

their counterparts in the mid-1980s had. For example, about 8% of mothers who gave birth in the mid- and late 1980s withdrew from the labour market in the first three post-childbirth years, but in the late 1990s and early 2000s, less than 6% of them withdrew from the labour market during the first three post-childbirth years.

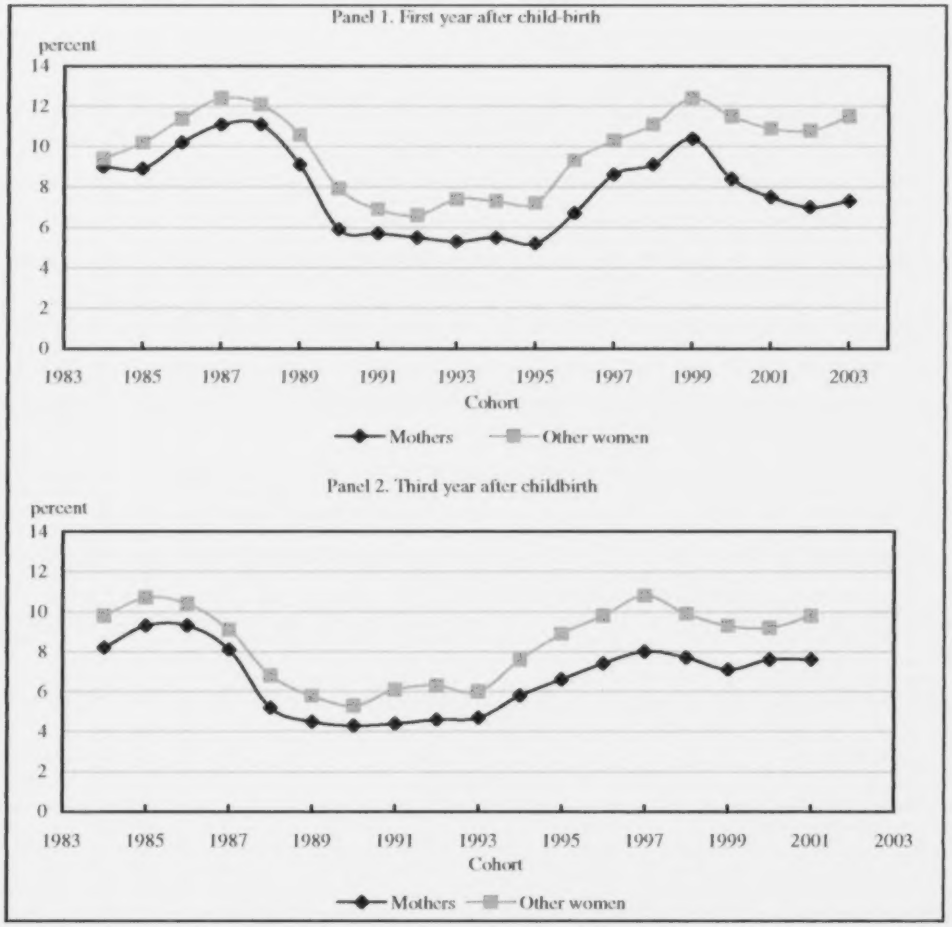
3.2 Post-childbirth job mobility

The birth of a child brings out the work-family balance issues for the parents, particularly for the mothers. Although the tradition that female workers completely withdraw from the labour market upon giving birth has long gone, some mothers may still quit their jobs because of work-schedule inflexibility, commuting difficulties or the lack of childcare services. We have calculated the quit rate of new mothers in the first few post-childbirth years and the quit rates for the comparison group. The main results are plotted in Figure 2.

Figure 2 shows that the quit rates of the new mothers and the comparison group both fluctuated over time: mothers who had given birth during the downturn of the economy had lower quit rates than those mothers who gave birth during the booming years. But more importantly, when compared with non-mothers, the quit rates of mothers, in both the short- and the long-run, and in both the downturn and the upturn, were consistently lower, and the differences became more evident over time. For example, in the mid-1980s, the quit rates of new mothers in the first post-childbirth years were generally below those of the reference group by about 1 percentage point; by the early 2000s, the difference increased to more than 3 percentage points.

The observation that mothers had lower quit rates than other women can readily be expected, since the quit rates of mothers were measured over a group of women who returned to the labour market after having given birth. Those who had not yet returned to work were not part of the population from which the quit rate was calculated. Also, on average, it is not unreasonable to assume that mothers who returned to the labour market were those who had stronger labour market attachments, stronger career motivations, and/or more productive job-matches than those mothers who had not returned to work—some of whom may never have returned—particularly in the longer term. In other words, the quit rates for mothers are defined over a selected group of mothers who had a relatively strong labour market attachment, and hence, it is possible that their quit rates were below the average quit rates of the comparison group.

Figure 2
Post-childbirth quit rates



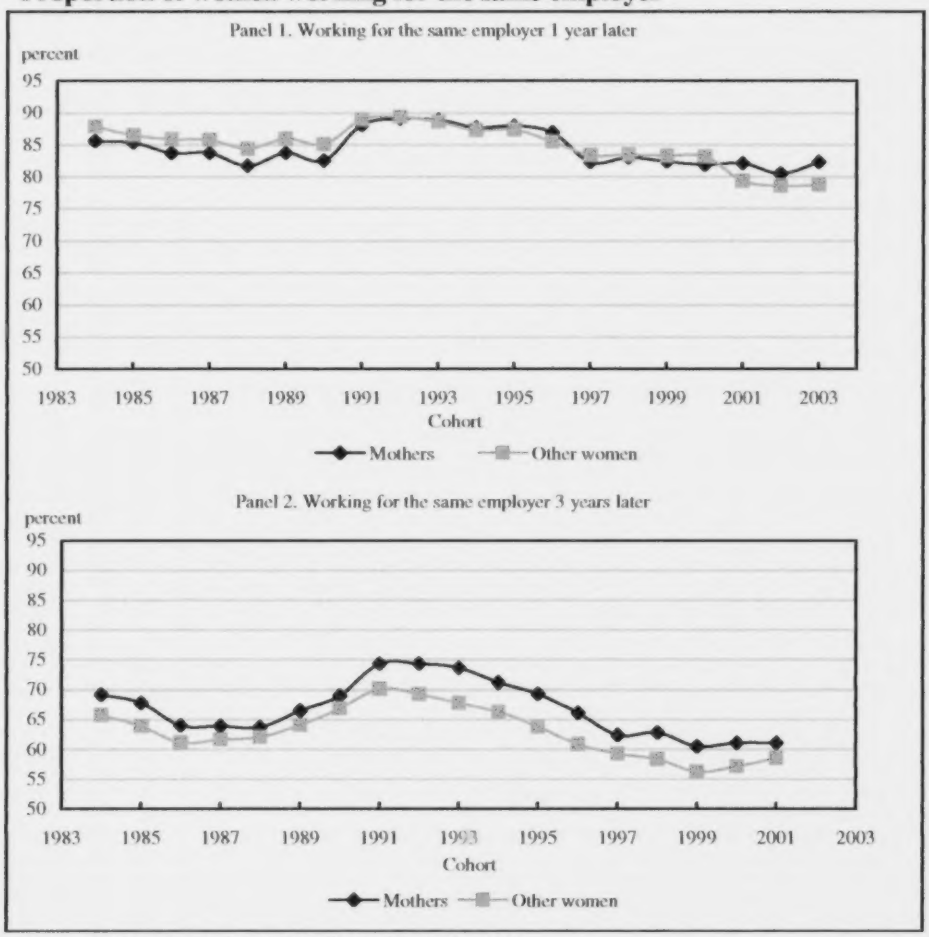
Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

Standard human capital theory suggests that whether a mother returns to her pre-childbirth employer/job can make a significant difference in the labour outcomes, since returning to the same employer/job implies that a mother would lose little of her firm-specific human capital or job tenure, particularly if she returns to her pre-childbirth job relatively quickly. Hence, it is interesting to directly examine the proportion of new mothers who were working for their pre-childbirth employers during the post-childbirth years.

These results are plotted in Figure 3 for the first and the third post-childbirth years. Again, the likelihood to work for the same employer was affected by economic fluctuations for both mothers and other women, primarily because less outside opportunity was available in an economic downturn than in an upturn. However, the more revealing result is that, as indicated in Panel 1, before 1991, Canadian mothers were slightly less likely to work for the same employer one year later than other women; the difference was about 2 percentage points. But since 1991, the proportion of new mothers staying with the same employer rose to the same level as that of other women, and from 2001, new mothers have become somewhat more likely than other women to stay with the same employer.

In terms of the proportion of women staying with the same employer in the longer run, we have found that successive cohorts of new mothers were more likely to stay with the same employer than the reference group in the past 20 years, and the differences stayed relatively constant, as indicated by Panel 2 of Figure 3. One reason for this might be that mothers with young children were less mobile than women from the comparison group, perhaps the presence of young children has made job change undesirable; for example, some working mothers with young children need to make new childcare arrangements when changing employers/jobs, while for the comparison group—women without children—such a barrier does not exist.

Figure 3
Proportion of women working for the same employer



Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

3.3 Earnings of Canadian mothers before and after childbirth

A simple measure of the effect of childbirth on the earnings of mothers is to compare the pre- and post-childbirth earnings of the mothers. This helps us to answer some interesting questions, such as to determine the immediate earnings drops that occurred to the mother when a child was born, how many years it took Canadian mothers to attain their pre-childbirth earnings, and how the earnings recovery process has evolved over the last 20 years.

The advantage of this approach is that we do not have to impose any strong sampling restrictions and hence we are able to work with a broad sample of Canadian mothers. The main disadvantage is that a simple comparison of the pre- and post-childbirth earnings does not reveal the true earnings effects of childbirth, since we do not know how the earnings of the mothers would have grown had they not have become mothers. Nevertheless, the comparison will provide us with some guidelines on the earnings effect of childbirth.

Table 3
Earnings changes (percent) relative to the pre-birth year (t-1)

Cohort	Year of birth	t+1	t+2	t+3	t+4	t+5
1984	-0.27	-0.16	-0.07	-0.06	-0.03	0.02
1985	-0.28	-0.16	-0.08	-0.06	-0.02	0.02
1986	-0.28	-0.16	-0.05	-0.05	-0.01	0.02
1987	-0.27	-0.15	-0.06	-0.05	-0.02	0.06
1988	-0.27	-0.15	-0.05	-0.06	0.03	0.04
1989	-0.27	-0.16	-0.08	-0.02	-0.01	0.00
1990	-0.27	-0.17	-0.03	-0.03	0.02	0.05
1991	-0.31	-0.15	-0.04	-0.03	0.01	0.04
1992	-0.28	-0.16	-0.02	-0.03	0.02	0.05
1993	-0.28	-0.16	-0.02	-0.03	0.02	0.05
1994	-0.31	-0.17	-0.05	-0.04	0.02	0.07
1995	-0.30	-0.16	-0.02	-0.02	0.05	0.11
1996	-0.31	-0.17	-0.01	0.02	0.09	0.12
1997	-0.30	-0.14	0.02	0.07	0.11	0.14
1998	-0.29	-0.15	0.04	0.03	0.06	0.14
1999	-0.30	-0.16	-0.02	-0.03	0.04	0.10
2000	-0.30	-0.18	-0.04	-0.03	0.04	...
2001	-0.34	-0.39	-0.03	-0.05	...	...
2002	-0.35	-0.39	-0.04	...	...	...
2003	-0.31	-0.37	...	...	...	...

... not applicable
Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

Table 3 contains the changes in the average annual earnings for the 1984-to-2003 cohorts of Canadian mothers, where the percentages indicate how the earnings of the mothers changed in the year of childbirth and in the post-childbirth years, when compared with the earnings in the year before the child was born. The table suggests that the earnings drops for Canadian mothers were quite strong during the year of childbirth and in the first post-childbirth year, and that these drops tended to increase over time. During the 1980s, the birth of a child brought down the earnings of the mother by about 28% in the year of childbirth relative to her pre-childbirth earnings. This increased to the 30% level in the 1990s, and to about 33% after 2000. During the first post-childbirth years, the earnings drops relative to the pre-childbirth level were between 14% and 18% before 2001 and, since 2001, they have risen to the 37%-to-39% level.

The earnings drop in the year of childbirth and in the first year after childbirth were likely the results of the changing maternity leave and benefit systems. Prior to 1991, the maximum duration of the maternity leave benefits was 15 weeks. Therefore, those who gave birth within the first 37 weeks of a year would be able to collect the benefits during the year of childbirth. Assuming that the time of childbirth is uniformly distributed over the 52 weeks of a year, this group of mothers would then account for about 70% (37÷52=0.71) of mothers who gave birth within that year. If they all exhausted the maternity benefits (by collecting the Unemployment Insurance benefits for 15 weeks) and incurred no other earnings interruptions, they would lose about 30% of their potential earnings (15÷52=0.29). On the other hand, mothers who gave birth in the last 15 weeks of a year would incur less than 30% of an earnings drop during the year of childbirth, but they would incur some earnings drop by continuously taking their maternity leave and collecting the maternity benefits during the subsequent year (the first post-childbirth year).

Similar calculations can be made for other cohorts of mothers. In particular, the large earnings drops in the first post-childbirth year for the 2001-to-2003 cohorts of mothers can be easily understood because, from 2001, Canadian parents (mostly mothers) were able to receive Employment Insurance (EI) benefits for up to 50 weeks. Then, first, those who gave birth in the early part of a year were able to collect the benefits for almost a whole year, and therefore their earnings drops during the year of childbirth were now higher than those incurred by mothers who had given birth before 2001. Second, those who gave birth in the second part of the year could continue to collect the benefits for a significant part of the first post-childbirth year, and indeed for those who gave birth at the end of a year, they could rely on EI benefits for most part of the first post-childbirth year, and therefore, we observe higher earnings drops in the first post-childbirth year for the early 2000s cohorts of mothers.

Table 3 also suggests that the earnings of the 1990s and early 2000s cohorts of mothers recovered faster than those of the mid-1980s cohorts of Canadian mothers. For example, when we compare the earnings at t+5 (five years after childbirth) and t-1(one year before childbirth), it can be seen that for the mid-1980s cohorts of Canadian mothers, the t+5 earnings were only slightly above those of t-1. But for those mothers who gave birth after the mid-1990s, the t+5 earnings were generally higher than those in t-1 by 10% or more. The faster earnings recovery in the early 2000s seems to have been mainly due to the better labour market conditions observed since the late 1990s.

4 Earnings impacts of childbirth: Empirical framework

4.1 Previous researches

The earnings differences between mothers and other women, also sometimes referred to as the family gap, are well documented in many developed countries. On average, the raw earnings differences were around 20% in the United States and the United Kingdom; in Canada, it was estimated to be 17%.[17] A number of hypotheses have been proposed by researchers.

First, some authors attribute the family gap to unmeasured heterogeneity. The differences could be spurious if motherhood is negatively correlated with certain unobserved characteristics while the

17. The family gap is often measured in the hourly wage rate. For Canada, this was measured by personal income for women aged from 25 to 54 who worked full time during 1995. See Phipps, Buirton and Lethbridge (2001).

pay rate is positively correlated with these characteristics. An early study by Korenman and Neumark (1992) and a more recent study by Gupta and Smith (2002) show that the family gap between mothers and non-mothers decreased substantially, or disappeared completely, once individual fixed effects were controlled for.

Second, a related hypothesis is that the choice to become a mother is itself endogenous. Studies on female labour supply generally find that fertility is negatively correlated with the pay rate.[18] In the current context, since low pay implies the opportunity cost for a woman to separate from her job for family responsibilities is low, one or more years of low earnings may cause a woman to become a mother. A number of studies—such as Gronau (1988), Korenman and Neumark (1992), Edin and Nynabb (1992), and Belzil and Hergel (1999)—find no strong support for the hypothesis that low pay causes women to take time out for childbearing and rearing. But other studies—for example, Lundberg and Rose (2000)—find evidence of negative selection into parenthood, while Viitanen (2004) concludes that endogenous participation and fertility account for about 50% of the total family gap.

Third, the human capital theory generates a few explanations for the family gap. One of the hypotheses is based on the fact that most women interrupt their careers for childbearing and rearing and, as a result, accumulate fewer years of working experience. Also, during extended interruptions, mothers may also experience human capital depreciation. Most studies suggest that human capital losses are important factors in explaining the family gap, but these losses alone cannot explain all of the wage or earnings penalties. For example, Phipps, Buirton and Lethbridge (2001) find that controlling for experience accumulation and human capital depreciation reduces the earnings penalty from 17% to 12% in Canada, while Waldfogel (1998b) concludes that around 30% to 40% of the pay penalty can be explained by mothers' lower levels of experience and lower returns to their experiences.

Fourth, the work effort hypothesis asserts that child rearing and caring often create family and work conflicts for mothers and that these conflicts reduce the work effort of mothers. For example, Becker (1991) predicts that the extra household tasks associated with child rearing and caring consume a lot of energy from the mothers of young children and make them less productive at work than childless women. By including hours spent on unpaid household tasks in their analysis, Phipps, Buirton and Lethbridge (2001) find that the earnings penalty fell from around 13% to 7%. On the other hand, Anderson, Binder and Krause (2003) argue that since high-skilled jobs typically require more effort, the wage penalty would rise with the mothers' years of education. Their finding that the medium-skilled (high-school graduate) mothers suffer more prolonged and severe wage penalties than do either low- or high-skilled mothers casts some doubt on the work-effort explanation.

Related to the work-effort hypothesis is the self-selection hypothesis that predicts that potential mothers may choose 'mother friendly' jobs that have higher initial earnings but flatter the earnings growth path.[19] Budig and England (2001) examine whether mothers choose less energy-demanding occupations. They conclude that mother-friendly job characteristics explain little of the wage penalty incurred by mothers. Waldfogel and Mayer (2000) also find that controlling for occupation does not eliminate motherhood wage penalties.

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18. See Browning (1992) for a survey.

19. The slower earnings growth is also consistent with low (initial and subsequent) human capital investment of mothers who anticipate career interruptions.

Finally, some authors interpret the earnings differences between mothers and other women as a result of statistical discrimination, under which mothers earn less than childless women because employers expect them to be less productive because of child-rearing responsibilities. For example, Waldfogel (1995) attributes the unexplained portion of the family gap—after controlling for human capital and other variables—to employer discrimination or other causes.

While the aforementioned studies have improved our understanding toward the earnings gaps between mothers and other women, they are subject to a number of limitations. First, the vast majority of previous studies have failed to examine how the earnings differences had changed over the post-childbirth years. We contribute to the literature by investigating the earnings of mothers over a long period of time, including the years before childbirth. By examining how the earnings of a mother change before she gives birth, we are able to see if declining earnings cause a woman to self-select into motherhood.[20] By examining the earnings dynamics over many post-childbirth years, we are able to see if the family gap is permanent or temporary.

Second, our study is based on a very large administrative dataset. This not only allows us to construct a sample of women who became mothers over a number of years, it also permits us to construct a sample of women who did not give birth. With a sample of 'non-mothers,' we are able to borrow, from the program evaluation literature, statistical techniques that help us to obtain more reliable estimates of the earnings differentials.

Finally, unlike other studies, we also examine the effect of maternity benefits on the earnings changes of the mothers. Since mothers who temporarily withdraw from their jobs for maternity purposes typically receive certain amounts of compensation from the government—for example, in Canada, women who held paid jobs for a certain period of time were eligible for the Employment Insurance benefits during their maternity/parental leaves—ignoring the maternity benefits may lead one to overestimate the motherhood earnings penalties.

4.2 Empirical model

To model the earnings trajectories of mothers, and to take advantage of the strength of our data, we adopt a model developed by Jacobson, LaLonde and Sullivan (1993) in analysing the earnings losses of displaced workers in the U.S. state of Pennsylvania.[21] The model is characterized by a very flexible age–earnings profile that allows workers to have different earnings intercepts and earnings growth paths.

$$y_{it} = \alpha_i + \mathbf{X}_{it}\boldsymbol{\beta} + \sum_{k=a}^{b} \mathbf{D}_{it}^{k}\boldsymbol{\delta}_k + \omega_i t + \varepsilon_{it} \qquad (1)$$

20. We examine the earnings of the potential mothers for up to three years before the child is born. We notice that lower earnings related to sickness due to pregnancy might occur during the months before the child is born, and these earnings dips have nothing to do with the self-selection issue.

21. Ejrnæs and Kunze (2004) is the only study that follows this approach. The current work is different from theirs in two aspects: we allow different workers to have different earnings growth paths; and, we allow women to give more than one birth (see Section 6).

where y_{it} denotes the (log) annual earnings of woman i in year t, $\mathbf{X}_{it}$ is a vector of observable worker or job characteristics, α_i are individual-specific fixed effects, while $\omega_i t$ are the worker-specific earnings growth paths. ε_{it} is the idiosyncratic error term and $\mathbf{D}_{it}^{k}$ is a vector of dummy variables that equal 1 if worker i gives birth k years prior to year t (and $\mathbf{D}_{it}^{k} = 0$ otherwise). Notice that the worker-specific earnings growth path, $\omega_i t$, allows each woman to have her own person-specific slope of the earnings profile.

In order to examine the earnings changes of a mother around the years she gives birth, we specify $a = -3$ and $b = 9$.[22] The choice that $a = -3$ allows us to investigate how the earnings of a mother would change during the three-year period prior to childbirth. The estimated earnings changes over these years can be used to test if declining earnings cause women to leave their jobs for childbearing and rearing (the endogenous motherhood hypothesis). With $b = 9$, we can examine the earnings effects of childbirth over nine post-childbirth years.

When the restrictions that $\alpha_i = 0$ and $\omega_i = 0$ are imposed, the general model becomes a simple regression model, while if the restriction $\omega_i = 0$ alone is imposed, we obtain the fixed-effects model. In the case where the earnings differences between mothers and other women are purely due to unobserved heterogeneity, the fixed-effects estimates of earnings effects of childbirth would be equal to 0. Hence the fixed-effects model allows us to test if earnings differences between mothers and other women are spurious.

The fixed-effects model also helps to reduce the potential bias caused by omitted variables that are constant over time—immigration status, for example. However, estimates from the fixed-effects model can be biased since, on the one hand, not all omitted variables are constant over time; for example, education and experience. On the other hand, mothers may self-select into jobs with flatter earnings-growth paths. Hence, the model that allows all women to have different slopes of the earnings profiles is more general and flexible than the fixed-effects model.

5 Estimated motherhood earnings losses for women with strong labour market attachment

In this section, we present our estimates of the earnings effects of childbirth and test the relevant hypotheses.[23] We focus on those mothers who gave birth once. In the next section, we discuss the robustness of our results with respect to those mothers who had one or two births and whether the effect of the first-born child is different from that of subsequent children.

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22. The conclusion by Browning (1992) that children aged up to 10 years could be as costly as infants partially motivated our choice of b=9. The choices for a and b involve a trade-off between more cohorts of mothers with estimates of earnings losses over fewer years around childbirth and fewer cohorts of mothers with estimates of earnings losses over more years around childbirth.

23. The model is estimated in two steps. In the first step, we regress annual earnings on a series of year dummies and the provincial specific unemployment rates of female workers 15 years old and over (the data were retrieved from CANSIM, Table 282-0086). This purges the effects of the overall earnings growth trend and the provincial specific business cycle on earnings. In the second step, we regress the residuals from the first step on the quadratic term of age and year of childbirth indicators.

5.1 Basic results

Table 4 contains the estimates for the 3,714 mothers who had one birth during the 1991-to-1996 period. The comparison group consists of the 20,992 women who did not give birth during the 1983-to-2004 period. The dependent variable in Panel 1 is the natural log of annual earnings, while that in Panel 2 is the annual earnings. We include the regression result in annual earnings in order to give the reader an idea of the dollar amount of the effects of childbirth.[24]

First, our estimates show that the earnings differences between mothers and other women were not likely to be spurious because the differences were significant, even when the fixed effects were controlled for. Our results from both the fixed-effects model and the more general fixed-trend model suggest that the earnings differences were close to 40%—over $11,000—in the year of childbirth and 30%—close to $8,000—in the first post-childbirth year. These were mostly the results of new mothers' temporary withdrawal from the labour market and would be partially compensated by the Employment/Unemployment Insurance benefits. We investigate the effects of these benefits on the earnings trajectories of mothers in the next subsection.

However, childbirth did not only affect the earnings of the mothers during the year of childbirth or the first post-childbirth year; on the contrary, the earnings difference continues to be there over a number of post-childbirth years. For example, the fixed-effects model estimates indicate that, from the second to the ninth post-childbirth years, the annual earnings differences between mothers and the comparison group ranged from 5%—around $1,300—to 10%—around $2,700—with lower earnings penalties occurring in the years further after the child is born. The fixed-trend model estimates point to a similar conclusion, albeit the estimated magnitude of the motherhood earnings penalty was smaller than those under the fixed-effects model.

24. Regression in level for other specifications will not be included hereafter but they are available from the author.

Table 4
Basic estimates, fixed-effects and fixed-trend models

	Fixed-effects model		Fixed-trend model	
Year(s) away from childbirth	Estimate	t-value	Estimate	t-value
	Dependent variable=Log annual earnings			
3 years ago	0.0285	2.25	0.0119	0.99
2 years ago	0.0165	1.26	0.0125	0.85
1 year ago	0.0290	2.38	0.0374	2.54
Year of childbirth	-0.4096	-32.76	-0.3977	-25.49
1 year after	-0.3154	-22.37	-0.2961	-17.94
2 years after	-0.1017	-8.01	-0.0762	-4.89
3 years after	-0.0992	-7.97	-0.0689	-4.53
4 years after	-0.0978	-7.68	-0.0638	-4.13
5 year after	-0.0872	-6.77	-0.0508	-3.26
6 years after	-0.0824	-6.54	-0.0455	-2.92
7 years after	-0.0702	-5.41	-0.0299	-1.92
8 years after	-0.0531	-4.25	-0.0077	-0.52
9 years after	-0.0489	-3.82	0.0004	0.03
	Dependent variable=Annual earnings			
3 years ago	456	1.46	242	0.70
2 years ago	411	1.32	576	1.56
1 year ago	644	2.14	1,114	2.96
Year of childbirth	-11,569	-37.08	-11,236	-29.27
1 year after	-8,098	-24.26	-7,598	-19.59
2 years after	-2,726	-8.77	-2,097	-5.64
3 years after	-2,783	-8.76	-2,063	-5.61
4 years after	-2,599	-7.96	-1,828	-5.04
5 year after	-2,258	-6.90	-1,473	-4.09
6 years after	-2,189	-6.78	-1,438	-4.05
7 years after	-1,778	-5.34	-977	-2.83
8 years after	-1,682	-5.08	-696	-2.13
9 years after	-1,278	-3.65	-137	-0.43

Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

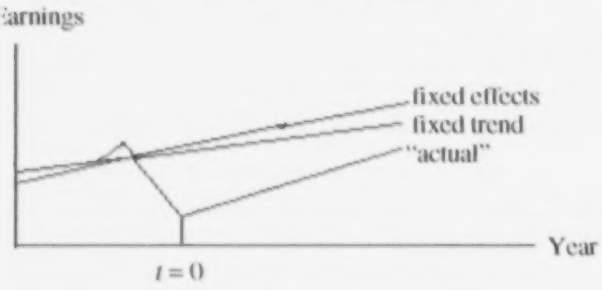
But the effects of childbirth on the earnings of the mothers did not seem to last forever. Under the fixed-effects specification, motherhood earnings losses declined from 10% to 5% from the second to the ninth post-childbirth years; while the estimates from the more general fixed-trend model indicate that the earnings gap between mothers and non-mothers amounted to 8% in the second post-childbirth year, and they declined to 5% in the sixth year, and 3% in the seventh year. The estimate for the seventh year was only significant at the 10% level. After the seventh year, the estimates were no longer significant. These findings contradict the notions that human capital losses due to childbirth permanently reduce the earnings of a mother, and that mothers who interrupted their careers as paid employees for childbearing and rearing can never entirely regain their potential earnings.

The estimation results also suggest that the annual earnings of Canadian mothers did not decline during the years before they gave birth. On the contrary, they continued to increase, at least in the year immediately before childbirth. The fixed-effects estimates show that the earnings in the pre-childbirth year increased by 3%, while the fixed-trend model indicates a close to 4% increase. These cast doubt on the prediction that women whose earnings declined—for example, due to bad job

matches—may choose to become mothers.[25] Hence, our results do not support the endogenous motherhood hypothesis.

In addition, as noted before, our estimated earnings differences between mothers and other women were lower under the fixed-trend model than under the fixed-effects model. We also notice that the further a post-childbirth year is from the year of childbirth, the more the earnings differences between mothers and other women can be explained by the inclusion of the individual-specific earnings growth trend. For example, in the second post-childbirth year, the earnings effect of 10% (from the fixed-effects model) was reduced to 8%, once the individual-specific earnings growth trend was taken into consideration (fixed-trend model). But in the seventh post-childbirth year, the corresponding earnings effects were reduced from 7% in the fixed-effects model to 3% in the fixed-trend model.

Figure 4
'Actual' and estimated earnings profiles



The above result is illustrated in Figure 4, where fixed-trend estimates of the earning effects of childbirth are lower than those of the fixed-effects estimates; and, the further a post-childbirth year is after the year of childbirth ($t = 0$), the fixed-trend and the fixed-effects estimates are further apart. Hence, our results suggest that women who become mothers may have flatter intrinsic age–earnings profiles than other women.

Given that the estimated effects of childbirth on the earnings of the mothers declined over the post-childbirth years, one would be tempted to confirm the work-effort hypothesis and to reject the human-capital hypothesis. Under the former, the earnings losses of the mothers would decline over the post-childbirth years while, under the latter, the negative effects would stay constant. Unfortunately, our data do not allow us to directly test these hypotheses, because some key variables are not available: for example, we do not have data on work effort and hours worked. If a mother reduces her working hours upon giving birth, and increases them gradually as the child grows older while keeping her work effort constant, we would also be able to obtain the current estimates.

In summary, the basic results indicate that there exist some substantial earnings gaps between Canadian mothers—at least for those who had strong labour market attachment—and their non-mother counterparts, and the effects were unlikely spurious. But the gaps declined over the post-childbirth years and, according to the flexible fixed trend model, the differences would disappear seven years after childbirth.

25. Ejrnæs and Kunze (2004) discussed this notion of endogenous motherhood.

5.2 Effect of Employment Insurance benefits

As mentioned above, employed Canadian mothers who temporarily withdrew from the labour market due to childbirth were eligible for compensations in the form of Employment Insurance (EI) benefits. From 1991 to 1996, mothers were eligible to receive the benefits for a maximum of 25 weeks, and the statutory replacement rates ranged from 55% to 60%.[26] An immediate question is how EI benefits affect our estimated effects of childbirth on earnings.

Between mothers and non-mothers, since only the former could receive the maternity benefits during a certain period of time surrounding childbirth, it is straightforward to answer the above question—for example, by subtracting the maternity benefits received from the estimated earnings losses. But in the Longitudinal Worker File, we do not know when a mother started to receive the benefits and if all of the benefits she received were related to maternity leave. This would be the case when a mother might experience other job separations not related to the childbirth; in our narrow sample, we only assume mothers did not experience any permanent layoffs.

Given the limitations of the data, a simple way to address the above question is to add the EI benefits received to the total employment earnings for all women—mothers and women from the comparison group—in all years of observation. In other words, we shall define a new 'earnings' concept that equals the sum of employment earnings and EI benefits, and then re-estimate the basic model. Results from the fixed-trend models are contained in Table 5.[27]

Table 5
Effect of Employment Insurance benefits, fixed-trend model

	Log annual earnings		Annual earnings	
Year(s) away from childbirth	Estimate	t-value	Estimate	t-value
3 years ago	0.0172	1.85	351	1.12
2 years ago	0.0275	2.41	790	2.35
1 year ago	0.0403	3.45	1,111	3.18
Year of childbirth	-0.1593	-13.11	-5,633	-16.31
1 year after	-0.1536	-12.09	-4,694	-13.37
2 years after	-0.0563	-4.53	-1,732	-5.02
3 years after	-0.0488	-4.00	-1,654	-4.84
4 years after	-0.0472	-3.76	-1,491	-4.39
5 year after	-0.0398	-3.11	-1,226	-3.61
6 years after	-0.0370	-2.88	-1,221	-3.62
7 years after	-0.0243	-1.91	-816	-2.49
8 years after	-0.0073	-0.59	-583	-1.87
9 years after	-0.0027	-0.22	-89	-0.29

Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

The results show that the earnings gaps between mothers and other women dropped substantially in the year of childbirth and the year thereafter, once the maternity benefits are taken into consideration. In particular, our basic estimates (Table 4) suggest that the total earnings effects in

26. The number of weeks of maternity benefits was extended to 50 weeks as of January 1, 2001.

27. Fixed-effects models were also estimated (available upon request). The estimated earnings losses were slightly higher than for those under the fixed-trend models. For example, in the year of childbirth and the year after, the fixed-effects estimates were around -0.18 and significant.

the year of childbirth and the first year after were close to $19,000. But once the benefits were taken into account, as Table 5 indicates, the corresponding estimates decreased to about $10,000.

The estimated-earnings effects from the second to the eighth post-childbirth years were also 1 to 2 percentage points lower under the new earnings definition than previously estimated. In terms of dollar amounts, the total earnings gap was close to $9,000 over the seven post-childbirth years. In contrast, when EI benefits were not included, the total earnings gap over these seven years amounted to about $10,000 (Table 4). Hence, the EI benefits further reduced earnings effects of childbirth by about $1,000 for these post-childbirth years. Taken together, the total motherhood earnings gap—over all the post-childbirth years—was reduced from $29,000 to $19,000, due to the maternity benefits.[28]

5.3 Do mothers who change employers lose more?

We next estimate the model controlling for the fact that some mothers worked for different employers after giving birth. Since those who worked for the same employers after giving birth would lose little of their firm-specific human capital or their job tenure, we would expect their earnings drops to be significantly lower than those who changed employers after having given birth.[29]

28. On top of the maternity benefits provided by the federal government, some employers offer their workers supplementary benefits for maternity and parental leaves. Although we do not have any information on the percentage of the supplementary benefits, about one third of employees (regardless of gender) reported that their workplaces offer such benefits (Workplace and Employee Survey 1999, 2001 and 2003). Hence, one third of Canadian mothers would have an earnings gap less than $10,000, depending on how much their employers topped up the maternity benefits.

29. An important reason for a new mother to change employer is to facilitate child caring and the schooling of the child. This generally occurs when the child is aged 5 or younger. To reflect this, we define a dummy variable that equals 1 if a mother worked for the pre-childbirth employer in at least five consecutive years after giving birth. We interact this dummy variable with each of the years of childbirth indicators ($\mathbf{D}_a^k$).

Table 6
Effect of employer changes

	Fixed-effects model		Fixed-trend model	
Variables	Estimate	t-value	Estimate	t-value
3 years ago	0.0251	1.76	0.0120	0.85
2 years ago	0.0258	1.75	0.0174	1.01
1 year ago	0.0464	3.62	0.0476	2.95
Year of maternity	-0.3816	-28.49	-0.3787	-21.95
1 year after	-0.2775	-18.30	-0.2674	-14.77
2 years after	-0.0455	-3.56	-0.0294	-1.78
3 years after	-0.0443	-3.45	-0.0234	-1.43
4 years after	-0.0409	-3.19	-0.0164	-1.02
5 year after	-0.0488	-3.67	-0.0219	-1.31
6 years after	-0.0582	-4.37	-0.0267	-1.59
7 years after	-0.0520	-3.78	-0.0155	-0.93
8 years after	-0.0434	-3.27	-0.0014	-0.08
9 years after	-0.0337	-2.53	0.0098	0.60
	Different employer[1]			
3 years ago	0.0032	0.11	-0.0017	-0.07
2 years ago	-0.0328	-1.07	-0.0177	-0.56
1 year ago	-0.0558	-1.86	-0.0357	-1.06
Year of maternity	-0.0918	-3.02	-0.0663	-1.88
1 year after	-0.1268	-3.72	-0.1016	-2.70
2 years after	-0.1909	-5.95	-0.1660	-4.53
3 years after	-0.1866	-6.10	-0.1619	-4.59
4 years after	-0.1935	-6.06	-0.1690	-4.54
5 year after	-0.1288	-4.07	-0.1046	-2.82
6 years after	-0.0784	-2.58	-0.0691	-1.82
7 years after	-0.0551	-1.77	-0.0531	-1.38
8 years after	-0.0196	-0.65	-0.0225	-0.61
9 years after	-0.0384	-1.17	-0.0351	-0.89

1. Different employer is the interacting variable.
Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

This was indeed the case as shown by the estimates in Table 6. Estimates from the fixed-effects model show that the negative effects of childbirth on the earnings of mothers who worked for the same employer amounted to from 3% to 6% during the post-childbirth years, much less than the losses incurred by mothers who changed employers. But once we allow for individual specific-earnings growth paths, the effects were only significant in the year of childbirth and in the first two years thereafter, and the estimate for the second post-childbirth year was only marginally significant.

While the finding that mothers who stayed with the same firm incurred little earnings drops and those who changed employers incurred significantly higher earnings drops is consistent with the predication of firm-specific human-capital hypothesis, the result can also be interpreted as one that is due to the losses of earnings premium that had resulted from good job matches. Alternatively, it is possible that when a mother changes employers, she may change from a full-time job to a part-time one, or she may change from a well-paid job to a less well-paid one in order to facilitate child rearing and caring.

6 Robustness check

6.1 Effects of first birth

One criticism concerning our results in Section 5 is that some women might have given birth once or more before they were first observed in out data, and that the earnings effect associated with the first-born child can be different from that associated with subsequent children, other things being equal. Indeed, first-born children can be different from subsequent children in that they could consume more time from the mother than their future siblings. For example, the first-born child can get sick more easily than subsequent siblings because of the lack of parenting experience. It is also possible that first-time mothers are more sensitive about their children than are experienced mothers.

Admittedly, some of the 3,714 mothers who gave birth once in the 1991-to-1996 period could have had one or more births before they were first observed (in 1983), since some of them were already as old as 29. Therefore, it is desirable to assess whether the first-born child costs more or not than the subsequent children. Since the Longitudinal Worker File does not contain information on birth sequence, a simple way to deal with the problem is to single out a group of mothers who were very young when they were first observed, and were therefore unlikely to have given birth previously. We highlight a group of mothers who gave birth once in the 1991-to-1996 period, were 15- to 19-year olds in 1983 and had not given birth from 1983 to 1990; we then investigate the earnings-gap differences between them and the older mothers.[30] The results are contained in Table 7.[31]

The bottom portion of the left side of Table 7 indicates the net effect of the 'first-born' child on the earnings of their mothers. The fixed-effects estimates (not shown in the table) suggest that the first-time mothers did not appear to be different from other mothers, while the estimates under the fixed-trend model indicate that first-time mothers might suffer slightly more earnings drops, but these were not statistically significant, either before, during or after the year of childbirth.

30. Out of the 3,714 mothers, 837 fell into this group. We admit that it is still possible that some of them had given birth before 1983 (at age 18 or younger). But it is reasonable to assume that there were very few of them, since the average age of Canadian mothers when they first gave birth was around 25 in 1983 (24.8 in 1981 and 25.5 in 1985, see Statistics Canada [1995]).

31. Results under fixed-effects models are similar to those under the fixed-trend specifications for the corresponding groups.

Table 7
Effects of first birth

	Effect of first birth		Effect of possible previous birth	
Variables	Estimate	t-value	Estimate	t-value
3 years ago	-0.0011	-0.08	0.0137	0.96
2 years ago	-0.0007	-0.04	0.0117	0.66
1 year ago	0.0256	1.61	0.0408	2.32
Year of maternity	-0.3973	-23.82	-0.4004	-21.30
1 year after	-0.2980	-16.62	-0.2905	-14.72
2 years after	-0.0696	-4.22	-0.0838	-4.34
3 years after	-0.0600	-3.74	-0.0733	-3.81
4 years after	-0.0572	-3.54	-0.0648	-3.27
5 year after	-0.0458	-2.83	-0.0457	-2.26
6 years after	-0.0456	-2.82	-0.0342	-1.66
7 years after	-0.0346	-2.13	-0.0209	-1.00
8 years after	-0.0125	-0.80	0.0042	0.20
9 years after	-0.0077	-0.47	0.0095	0.44
	15 to 19 years old in 1983[1]		25 to 29 years old in 1983[1]	
3 years ago	0.0405	1.39	-0.0071	-0.31
2 years ago	0.0415	1.21	0.0072	0.26
1 year ago	0.0371	1.06	-0.0095	-0.33
Year of maternity	-0.0114	-0.30	0.0157	0.52
1 year after	-0.0006	-0.01	-0.0136	-0.41
2 years after	-0.0368	-0.92	0.0336	1.16
3 years after	-0.0457	-1.15	0.0230	0.84
4 years after	-0.0342	-0.82	0.0114	0.41
5 year after	-0.0258	-0.58	-0.0094	-0.33
6 years after	-0.0011	-0.02	-0.0301	-1.04
7 years after	0.0254	0.55	-0.0226	-0.78
8 years after	0.0280	0.64	-0.0312	-1.13
9 years after	0.0505	1.16	-0.0237	-0.82

1. 15 to 19 years old in 1983, and 25 to 29 years old in 1983 are the interacting variables.
Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

One problem associated with the above exercise is that the group of mothers we singled out were likely the most low-educated mothers, because under our sampling restrictions they would not have had much chance to obtain an education beyond high school (they were, at most, 19-year olds in 1983 and were in the labour market from then to 2004). Hence, their age–earnings profiles can be quite flat. In light of this argument, we also singled out a group of 'older' mothers who might have had one or more births before they were observed.

In particular, we chose a group of mothers who gave birth in the 1991-to-1996 period and we restricted them to those born in the 1954-to-1958 period (and hence were aged 25 to 29 in 1983), and they did not give birth between 1983 and 1990. Given that the average age of the first-time mothers was around 25 in 1983, these women might have given birth once or more before they were first observed. We investigated if this group of mothers had incurred any additional earnings drops. As the right panel of Table 7 shows, again there was no significant difference between these older and other mothers in the earnings effects of childbirth.

Thus, even though our basic results in Section 5.2 are based on mothers who might have had one or more births before they were observed, these possible and unobserved births were unlikely to have any consequence on our estimation results.

6.2 Two births compared with one birth

The results of Section 5.2 can also be criticised in that mothers in our treated group were restricted to those who gave birth only once in the 1991-to-1996 period. Indeed, Canadian women typically had more than one birth during that period—for example, the number of live births per women (the total fertility rate) was 1.66 in 1995 (Statistics Canada 1995). Hence, our results in the last section may be affected by the one-birth restriction.

In order to address this problem, we modify the empirical model by adding another vector of year-of-childbirth indicators for the second child, born within a four-year window following a previous birth and estimate this model with all of the 7,086 mothers who had one or two births.

$$y_{it} = \alpha_i + \mathbf{X}_{it}\boldsymbol{\beta} + \sum_{k=a}^{b} \mathbf{D}_{it}^{k}\boldsymbol{\delta}_k + \sum_{k=a}^{d} \mathbf{D}_{it}^{'k}\boldsymbol{\delta}_k^{'} + \omega_i t + \varepsilon_{it} \qquad (2)$$

where $\mathbf{D}_{it}^{'k}$ is defined in the same way as for $\mathbf{D}_{it}^{k}$, except it refers to the years surrounding the birth of the second child. All other aspects of the model remain to be the same as specified for Equation (1).[32]

Notice that, because $\mathbf{D}_{it}^{k}$ and $\mathbf{D}_{it}^{'k}$ are defined relative to the years the two children were born, the number of years for which we can identify the effects of childbirth are limited by both the data and the structure of these two vectors of dummy variables. In the previous section, we identified earnings effects for up to the ninth post-childbirth year for the one-child case. For the earnings effects associated with the second child, we will be able to identify one fewer parameter if the second child was born one year later, two fewer if the second child was born two years later, and so on.

32. The value of d depends on b and how many years have passed between the first and the second births. Let years between the two children be h, then $d=b-h$.

Table 8
Earnings effects due to a second child, fixed-trend model

	2 children, 2 years apart		2 children, 3 years apart		2 children, 4 years apart	
	Estimate	t-value	Estimate	t-value	Estimate	t-value
Years surrounding the birth of the first child						
3 years ago	0.0163	1.54	0.0206	1.87	0.0182	1.58
2 years ago	0.0239	1.93	0.0272	2.06	0.0216	1.56
1 year ago	0.0488	3.70	0.0513	3.89	0.0460	3.30
Year of maternity	-0.3869	-26.99	-0.3843	-26.52	-0.3893	-26.31
1 year after	-0.2862	-18.56	-0.2838	-18.23	-0.2882	-17.78
2 years after	-0.0669	-4.59	-0.0649	-4.42	-0.0691	-4.56
3 years after	-0.0609	-4.24	-0.0579	-4.01	-0.0622	-4.19
4 years after	-0.0576	-3.92	-0.0540	-3.68	-0.0573	-3.80
5 year after	-0.0463	-3.10	-0.0427	-2.87	-0.0448	-2.95
6 years after	-0.0423	-2.81	-0.0390	-2.60	-0.0407	-2.67
7 years after	-0.0278	-1.84	-0.0249	-1.65	-0.0263	-1.73
8 years after	-0.0069	-0.47	-0.0043	-0.30	-0.0051	-0.35
9 years after	0.0011	0.08	0.0021	0.14	0.0022	0.15
Years surrounding the birth of the second child						
3 years ago	-0.0081	-0.61	-0.0252	-1.53	-0.0589	-1.88
2 years ago	-0.0695	-3.74	0.0101	0.55	0.0139	0.71
1 year ago	0.0581	2.87	0.0337	2.24	0.0399	1.96
Year of maternity	-0.4271	-21.23	-0.4760	-25.06	-0.4890	-19.19
1 year after	-0.3256	-13.42	-0.2780	-12.59	-0.3162	-9.26
2 years after	-0.0662	-3.08	-0.0699	-3.38	-0.0592	-2.49
3 years after	-0.0599	-2.66	-0.0611	-2.69	-0.0570	-2.11
4 years after	-0.0583	-2.32	-0.0582	-2.51	-0.0868	-2.55
5 year after	-0.0522	-2.12	-0.0720	-3.40	-0.0629	-1.82
6 years after	-0.0401	-1.72	-0.0505	-2.12	...	...
7 years after	-0.0288	-1.37	...	...	...	...
Number of mothers who gave two births	1,274		1,147		596	

... not applicable
Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

The results under the fixed-trend model are presented in Table 8.[33] The top portion of the table contains the estimated effects of the first birth (or the only birth for some mothers), while the bottom portion reports the results for the second childbirth. The different columns separate the cases with respect to birth spacing. For example, estimates under the title "2 children, 2 years apart" represent the earnings effects of childbirth for mothers who gave birth twice and the two births were two years apart.[34]

The earnings effects of the first childbirth were very similar, regardless of how many years the two children were apart. For example, in the second post-childbirth year, the earnings effects were 7% across all groups of mothers, and all of the estimates were significantly different from 0; while in the seventh post-childbirth year, the corresponding estimates were close to 3%, and these were all marginally significant.

With respect to the second child, the earnings drops in the year of childbirth and in the first post-childbirth year were considerably higher than the corresponding estimates for the first birth, possibly because at the second birth the mothers had become older and may have taken a longer time to physically recover from childbirth. In the rest of the post-childbirth years, the earnings effects associated with the second child seemed to be similar to those associated with the first child, particularly when the two children were born within a relatively short time span.

7 Summary and conclusions

Using the 1983-to-2004 Longitudinal Worker File, this study has examined the post-childbirth employment, job mobility and earnings trajectories of Canadian mothers. We found that the short-term post-childbirth employment rates of Canadian mothers rose from the mid-1980s to 2000 and have declined since then. However, the long-term post-childbirth employment rates of successive cohorts of Canadian mothers kept increasing over time without any substantial diversion. Furthermore, Canadian mothers were also less likely to quit their jobs during the post-childbirth years than their 'non-mother' counterparts, and the differences also increased over time.

Focusing on a group of Canadian women who had strong labour market attachment, we first found that the earnings of mothers did not decline in the pre-childbirth years: a result that casts some doubts on one version of the endogenous motherhood hypothesis. Second, we found that the motherhood-earnings penalties were not spurious: in the year of childbirth and the year after, mothers from our sample experienced about 40% and 30% earnings drops, and they continued to

33. Fixed-effects models were also estimated. For the first childbirth, results under both the fixed-effects and the fixed-trend specifications are similar. For the second childbirth, results from the corresponding fixed-effects model also produce similar results as those presented for the year of birth and the first few years thereafter. But for years further away, such as the fifth, sixth or seventh year after the second birth, estimates under the fixed-effects models were almost twice as high as those from the fixed-trend model, highlighting the relevance to allow each woman to have an individual-specific earnings growth path.

34. The number of mothers who had two births one year apart (e.g., one in 1991 and the other in 1992) were 355, and the number of mothers who had two births five years apart were 251. Estimates based on these sub-samples were not reliable because of the small samples. We pooled those "2 children, 1 year apart" with those "2 children, 2 years apart", and those "2 children, 5 years apart" with those "2 children, 4 years apart". The results (not shown but available upon request) were similar to those presented in Table 8 for the corresponding non-pooled cases.

incur earnings losses during the other post-childbirth years. Third, the earnings effects of childbirth were not fixed; rather, they declined over the post-childbirth years: therefore, it may not be plausible to simply estimate a 'single' or an 'average' effect of childbirth on the earnings of the mothers.

Under the more general fixed-trend model specification, we found that the negative earnings effects of childbirth started to disappear from the seventh post-childbirth year, and thus—at least for a group of mothers who had strong labour market attachment—our finding contradicts the results of several studies that claim that earnings losses due to career interruption can never be fully regained.

Furthermore, earnings losses incurred by mothers who returned to, and worked for, their pre-childbirth employers were negligible beyond the second year of childbirth when individual earnings growth trend is controlled. This suggests that firm-specific human capital is likely an important factor in the earnings recovery process for Canadian mothers, but due to the lack of accurate information on labour supply—such as hours worked or full/part-time status—we cannot make a firm inference on the role of firm-specific human capital.

It is therefore desirable to investigate the effect of childbirth on the labour supply decision of the mothers as well as the effect of childbirth on the wage rate of the mothers simultaneously.

Appendix Evolution of the job-protected maternity leave system in Canada

The job-protected maternity leave legislations in Canada are under provincial jurisdiction. In the 1980s, Canadian mothers were provided with 17 to 18 weeks of job-protected maternity leaves within which their employers were legally obliged to give the pre-childbirth jobs back to eligible mothers.

From 1991 to 1999, the maximum weeks of mandated job-protected maternity and parental leave were between 29 and 35 weeks in British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, and Prince Edward Island. By 2000, these provinces had raised their maximum job leaves to between 52 and 54 weeks.

The maternity leave systems evolved somewhat differently in Alberta, Quebec and Saskatchewan. Quebec extended its maternity leave system from 18 to 52 weeks in 1991, and to a further 70 weeks in 1997. While Alberta continued with an 18-week job protection up to 2000, Saskatchewan extended its system from 18 to 30 weeks in 1996; by 2001, the job-protected maternity leave systems in these two provinces were both set at 52 weeks.

Table A.1
Birth statistics from the Longitudinal Worker File and Survey of Labour and Income Dynamics

	Number of births given by employed women 18 to 49 years		Number of births by women with 1 or 2 births	Number of women who gave 1 birth
Year	Longitudinal Worker File estimate	Survey of Labour and Income Dynamics estimate	Narrow sample	Narrow sample
	(1)	(2)	(3)	(4)
1991	163,340	...	1,626	792
1992	157,320	...	1,581	772
1993	152,990	146,866	1,614	651
1994	151,990	166,881	1,719	577
1995	149,960	164,645	1,631	534
1996	140,770	153,627	1,269	388
1997	139,170	134,376	...	...
1998	143,220	139,223	...	...
1999	146,160	131,638	...	...
2000	143,330	126,023	...	...
2001	169,780	157,405	...	...
2002	163,460	157,405	...	...
2003	168,010	152,218	...	...
2004	172,880	169,546		
Total			9,440	3,714

... not applicable

Sources: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004, and Longitudinal Worker File, 1983 to 2004.

Table A.2
Conditional employment and withdrawal rate, other women

	Conditional employment rate (percentage)					Withdrawal rate (percentage)	
Cohort	t+1	t+2	t+3	t+4	t+5	3 years	5 years
1984	97.1	93.2	90.9	89.0	87.3	1.5	1.1
1985	97.0	93.3	91.0	89.1	87.5	1.6	1.2
1986	96.9	93.3	91.2	89.2	86.8	1.5	1.1
1987	97.0	93.3	91.0	88.3	86.3	1.5	1.2
1988	97.0	93.1	90.2	87.9	85.5	1.6	1.3
1989	96.8	92.5	89.6	87.0	85.2	1.8	1.4
1990	96.5	91.9	88.8	86.7	84.9	2.0	1.6
1991	96.2	91.4	88.7	86.6	84.5	2.2	1.8
1992	96.1	91.7	89.0	86.6	86.0	2.3	1.8
1993	96.3	92.1	89.2	88.3	86.7	2.3	1.7
1994	96.4	92.2	90.7	88.7	87.5	2.0	1.5
1995	96.3	93.3	90.9	89.3	88.1	1.9	1.4
1996	96.9	93.4	91.4	89.9	88.0	1.8	1.3
1997	96.5	93.5	91.6	89.5	87.9	1.9	1.5
1998	96.5	93.6	91.1	89.2	87.8	1.9	1.5
1999	96.8	93.3	91.0	89.3	87.4	1.9	1.5
2000	96.6	93.2	91.1	89.0	...	2.0	...
2001	96.7	93.5	90.7	...	...	1.9	...
2002	96.8	93.0	...	...	...	...	...
2003	96.2	...	...	...	...	...	...

... not applicable
Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

Table A.3
Pre-childbirth characteristics (percentage), representative cohorts of the broad sample and of mothers

Cohort characteristics	1984		1994		1999	
	Mothers	Other women	Mothers	Other women	Mothers	Other women
Age						
20 to 24	20.1	26.5	10.6	18.5	11.2	19.3
25 to 29	46.4	26.6	37.2	22.8	32.2	22.0
30 to 34	26.8	23.8	39.1	27.7	38.2	25.2
35 to 39	6.7	23.1	13.0	31.0	18.4	33.4
Previous year earnings						
1st quartile	14.3	25.8	14.3	25.8	12.7	25.8
2nd quartile	26.4	24.9	25.3	25.0	25.3	25.0
3rd quartile	30.9	24.6	28.8	24.7	29.8	24.7
4th quartile	28.4	24.8	31.6	24.5	32.2	24.5
Employer size						
<20 workers	14.8	18.8	20.1	22.7	19.6	22.5
20 to 99 workers	12.8	13.8	14.2	15.7	16.8	17.0
100 to 499 workers	14.4	13.2	13.9	13.2	13.6	13.1
500+ workers	58.0	54.2	51.8	48.5	50.0	47.3
Size in private sector						
<20 workers	16.4	21.2	21.7	24.4	20.6	23.9
20 to 99 workers	14.2	15.2	15.9	17.0	18.7	18.6
100 to 499 workers	12.2	11.3	12.7	11.8	12.8	12.2
500+ workers	57.2	52.4	49.7	46.9	48.0	45.3
Industry						
Primary	2.2	2.3	1.3	1.5	1.3	1.6
Manufacture	11.3	10.5	11.1	10.2	11.6	10.6
Construction	2.3	2.0	2.2	2.1	2.0	2.0
Transportation	1.5	1.6	1.7	1.7	1.6	1.8
Communication	1.8	1.8	1.9	2.0	1.6	1.9
Wholesale	3.6	3.8	4.1	4.2	4.2	4.6
Retail	17.2	17.5	17.0	18.4	16.1	17.3
Finance	6.5	6.1	5.9	5.8	5.6	5.3
Real estate	1.2	1.3	1.1	1.1	0.9	1.0
Business service	9.4	9.9	9.6	10.0	9.5	10.7
Government	2.1	2.4	2.5	2.5	1.6	1.9
Education	7.7	7.6	7.4	5.8	8.7	6.8
Health	17.4	14.6	17.4	15.1	16.6	13.9
Accommodation	3.8	5.3	5.1	7.2	6.6	8.2
Other services	3.1	4.5	4.8	5.6	5.0	5.8
Unknown	9.1	8.9	7.0	7.0	7.0	6.9

Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

Table A.4
Simple descriptive statistics for narrow sample of mothers and other women

	Mothers	Other women
Earnings (2000 dollars)		
Mean	34,878	33,201
Median	34,048	31,913
Age		
Mean	29	32
Median	28	32
Employer size (percentage)		
<20 workers	10	11
20 to 99 workers	11	11
100 to 499 workers	13	13
500+ workers	67	65
Sector (percentage)		
Public	19	18
Private	81	82
Number of observations	7,086	22,099

Source: Statistics Canada, Longitudinal Worker File, 1983 to 2004.

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